VOL. XIII. AUGUST, 1886. No. 8.

THE

Journal

OF

Nervous and Mental Disease.

Original Articles.

A CLINICAL STUDY OF LATERAL HEMIANOPSIA.*

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CONSIDERABLE progress has been made in the attempt to locate the cortical centre for vision, and the path of the fasciculus opticus from it to the primary optic centres. Indeed, a recent analysis of cases[1] of lateral hemianopsia would seem to justify the proposition that in the cuneus and adjacent cortical gray substance there is in either hemisphere a centre for half vision. If one cuneus is destroyed, lateral hemianopsia results, and if both cunei are disorganized, we have complete blindness, at least for higher organized vision. The state of our knowledge is such as to render every new case of lateral hemianopsia with autopsy of extreme interest and scientific value; yet it does not, I think, render quite useless the publication of cases without post-mortem study. A number of points in the clinical history and symptom-grouping of hemianopsia may be illustrated by such cases, and the diagnosis *intra vitam* of other cases facilitated. Such is my apology for presenting this paper to the Association.

* Read before the Association of American Physicians at its first meeting, in Washington, D. C., June 19, 1886.

[1] A Contribution to the Pathology of Hemianopsia of Central Orgin (Cortex Hemianopsia), this JOURNAL, Jan., 1886.

The cases are nine in number, and are naturally divisible into two groups: First, a group of three cases, in which lateral hemianopsia was one of a considerable symptom-group of what I may call hemi-symptoms; second, a group of six cases, in which lateral hemianopsia was the sole, or at least the strikingly predominant, symptom of organic cerebral disease.

GROUP I.—Cases of lateral hemianopsia, with hemiplegic symptoms, probably due to lesion of the outer edge of thalamus and of the internal capsule in its caudal part.

CASE I.—Male, æt. fifty-three. Seen in consultation with Dr. P. C. Cole.

Constitutional syphilis, contracted about ten years ago; secondary symptoms.

On March 4th, developed right hemiparesis, right hemianæsthesia, and aphasia; attack not apoplectic.

Examination showed ataxic aphasia, alexia, partial paralysis, and anæsthesia of right face and limbs. Right lateral hemianopsia, vertical line passing to right of point of fixation. Central vision good with glasses for presbyopia.

Rapid improvement under thorough mixed treatment; KI up to 350 grains a day.

Re-examined May 29th. Speech about normal. No agraphia, but handwriting is awkward. Only a trace of right-side paresis. Sensibility of right hand (and of face) normal to tests, but patient declares that it is not as fine or distinct as upon left side. The hand and forearm exhibit, in voluntary movements, well-marked ataxic-choreic movements. Central vision good; color-perception unimpaired. Right lateral hemianopsia persists. Near median line of darkened half fields is a zone of imperfect vision —mere perception of object used in testing.

Pathological Diagnosis.—The lesion in this case was very probably syphilitic arteritis of the left posterior cerebral artery, with obliteration of the small branches supplying the caudal segment of the internal capsule and the outer part of the thalamus opticus.

CASE 2.—Mr. H., aged sixty-two years, seen January 3, 1881. Is a man of unusual intelligence and culture; master of several living languages. Enjoyed good health; had no premonition, and on May 19, 1880, returned home from business with a numb and queer feeling in right arm. Was not well for three days, and on morning of May 23d awoke with right hemiplegia and incomplete aphasia. Was semi-comatose later in the day, and remained so for several days. There must have been marked hemianæsthesia, as patient did not know when his right foot and hand lay in or out the bed. He spoke much, but mis-

called things. Vision was imperfect to the right of the patient. No serious general symptoms. Improved rapidly as regards power of motion, speech, and writing. The only remains of the attack are right paresis with ataxic movements and partial anæsthesia, right lateral hemiopia and alexia. Has learned to write with left hand.

Examination.—Very slight right hemiparesis. Awkwardness and ataxic movements of right hand and foot; marked tactile and caloric anæsthesia of right hand; feels pain or a simple touch well, yet he is unconscious of passive movements of fingers and hand when his eyes are closed (so-called loss of muscular sense). Has incomplete homonymous (or lateral) hemiopia; right temporal and left nasal fields darkened. No positive contracture. Heart and kidneys normal.

Speech is a trifle thick, but not aphasic to any extent; occasionally uses a wrong word; writes well with left hand, and composes a letter in French, German, or English as well as ever; no omissions. Sees letters and numerals, but can't read except by a laborious process of spelling; some few short and familiar words he reads at once. Hemiopia does not cause this alexia, as shown by his ability to read any word by spelling it. The blindness is for words, or rather for the images or concepts which words represent. There is no word-deafness, and, beyond some hysteria, mental action is good.

Pathological Diagnosis.—Atheromatous degeneration of left posterior cerebral artery, causing softening of the outer part of the thalamus, and partly of the caudal division of the internal capsule. Path for muscular sense specially involved.

CASE 3.—A male patient, æt. twenty-six, referred to me by Prof. Edward Curtis. On April, 16, 1876, sudden attack of right hemiplegia in the street; was only partially paralyzed. Next day, well-marked amnesic (?) aphasia; right arm powerless; much numbness of right cheek and arm. "Could see only with inner half of right eye," as patient expresses it.

Rapid improvement in speech and walk. Right arm slowly regained its power.

Since then, irregular jerking movements have appeared in right arm (not in face and leg); marked numbness of entire right side of body; defect in vision has persisted; has had several epileptiform attacks.

Probably had syphilis six or eight years ago; chancres; and, later, ulcerated legs.

Examination shows right hemianæsthesia, partial in degree. Paresis of right upper extremity, with marked ataxia during volitional efforts. At rest there are small quasi-rhythmical movements of the hand and fingers. The movements are therefore of the mixed ataxic-choreic type. The pupils and eye muscles are normal; no ophthalmoscopic lesions visible. The fault in vision is a right lateral hemianopsia, not quite reaching the point of

fixation, and not with a vertical line; about one third of the visual field is obscured (two thirds of each half field).

The diagnosis recorded at the time of observation (1877) was a simple hemorrhage just outside the left thalamus; and in publishing the case[1] I pointed out that it contradicted Charcot's dictum (since abandoned) that hemianopsia could not be produced by a strictly cerebral lesion.

I see no reason to alter this diagnosis. The patient was given the benefit of the doubt as to syphilis, and treated with Hg and KI, but without relief to the hemianopsia and post-paralytic chorea.

GROUP II.—Cases of bilateral hemianopsia without hemiplegic symptoms. Lesion probably in one cuneus and adjacent gray matter.

CASE 1.—Male, æt. fifty-two. Seen in consultatation with Dr. H. H. Tinken, June 13, 1882. Former health good, with exception of severe attack of migraine with vomiting frequently in the last ten years. Has had rheumatic manifestations, but positively denies any venereal disease.

On February, 23, 1882, in a severe attack of migraine, after violent vomiting, suddenly found that he could not see on his left. Later in day was completely blind. No paralytic phenomena or unconsciousness; for a week or ten days was ill with slight fever (100°, 112°); after this, sight improved, but blindness to left remained.

On April 20th, in the midst of a debate, without loss of consciousness or paralysis, suddenly found himself "mixing up his words." Was able to write at once after attack. When seen later on same day by Dr. Tinken there was slight hemiparesis. Speech has since greatly improved.

Examination.—The only trace of right-sided paresis is a slight hanging of the lower part of the face; grasp normal; no hemianæsthesia; speech good. Pupils of the eye muscles normal; no lesion of fundus; with glasses for presbyopia reads easily; has typical lateral hemianopsia to left, with a concentric limitation of nasal half field of the left eye. Heart large, but without murmur. Albumen in each of three samples of urine.

Pathological Diagnosis.—Two separate attacks of cerebral hemorrhage: 1st, with destructive clot in right cuneus, and a slight ecchymosis (?) in the left cuneus (total obscuration of fields for a few days); 2d, clot in or near the speech centre of Broca in the left hemisphere.

CASE 2.—V. S., male, æt. fifty-seven. Seen in consultation with Dr. Herrick, of Paterson, Oct. 17, 1884. A prematurely

[1] A Contribution to the Study of Post-Paralytic Chorea, "Opera Minora," p 197.

senile man, who for two years has had polyuria (without albumen), sense of cerebral exhaustion, frontal headache, frequent attacks of dizziness, and marked loss of memory. Denies syphilis.

Eyes were examined by Prof. H. Knapp on August 30th, and he has kindly sent me the following memorandum: "V = $\frac{20}{20}$, fields complete." Not long afterward patient noticed that he could not see well to his right.

Examination.—Mental state very dull; memory feeble; no hemiplegia; good equilibrium; no anæsthesia. Pupils and eye muscles normal; no retinal changes; optic nerves abnormally whitish, but not distinctly atrophied; has right lateral hemianopsia with vertical limits; left half fields slightly contracted.

Pathological Diagnosis.—Atheromatous degeneration of the cerebral arteries, blockading the left occipital artery (branch of posterior cerebral artery), and consequent suffering of the cuneus and adjacent nervous substance.

CASE 3.—A. B., female, æt. thirty-four, referred by Dr. C. R. Agnew, Oct. 24, 1885.

A healthy woman, who has had four confinements. All normal. At the close of the third, in August, 1883, just after the child was born, had a peculiar attack, in which she experienced a "snap," or sudden pain, in the left temple, and felt giddy. For several days afterward she had severe pain in the head, and could not see objects to her right. At the same time that she first noticed darkness to her right, there were a few simple hallucinations (a chair, chickens, etc.) in the dark half fields. Vision was also generally dim.

No distinct hemiplegia, or aphasia. Has since suffered from more or less painful headaches, and has had a number of epileptic attacks, of grand-mal and petit-mal. Has had two distinct "auræ," one consisting in a sense of churning in the head, the other of numbness and stiffness (subjective) in the right arm and hand, with inability to speak or to use the right words.

The fourth confinement (perfectly normal) occurred in February, 1885.

Examination.—No distinct hemiplegia, or anæsthesia, or ataxia. Pupils small, but active. Eye muscles normal. Color-vision good. V = $\frac{12}{xx}$ with either eye alone, and $\frac{12}{x}$ with both eyes when page of book is held to her left. There is right lateral hemianopsia, with vertical division line passing a trifle to right of the fixation point. No ophthalmoscopic lesion. Heart has a basal systolic murmur, not transmitted upward.

Pathological Diagnosis.—Embolism of left occipital artery (branch of post. cerebral), with consequent softening of cuneus and adjacent nervous substance.

CASE 4.—Male, æt. fifty-six. Seen January 25, 1886. Also under the care of Dr. E. Gruening and Dr. H. Gulecke.

Only distinctly syphilitic affection is an indurated chancre, observed and treated by Dr. Gulecke, in spring of 1884. Mixed

treatment ordered, but not followed with any persistence. No secondary manifestations have appeared.

In spring of 1883, failing sight and pain about eyes. Glaucoma diagnosticated. Double iridectomy performed in August, 1883, by Dr. Gruening, with relief. Dr. Gruening informs me that just before the operation the left eye presented an incomplete lateral hemianopsia. After the operation the right eye also exhibited one-sided limitation of its field. There was not, however, true geometric lateral hemianopsia. There was no color-blindness, and the optic nerves were not atrophied.

In November, 1884, true lateral hemianopsia to the left was discovered, and has persisted unchanged.

The patient has complained of headache, and of inter-pressure. He has had several attacks of right-sided supra-orbital neuralgia; but he has had no paralysis, spasm, or anæsthesia. Depressed, but not demented.

Of late legs have been weak, and locomotion slow and uncertain.

Examination.—Left lateral hemianopsia, with vertical line passing a little to left of point of fixation. Central vision fairly good with glasses (not exactly tested). Optic nerves cupped, rather whitish, but not atrophied. No hemiparesis or anæsthesia. Very marked weakness of both legs, shown especially in rising from a chair; this is increasing. Staggers slightly, but the walk is not quite that of cerebellar disease. It is to be observed that the chancre occurred about six months before the true lateral hemianopsia was observed.

Pathological Diagnosis.—Either a tumor of right occipital lobe, or syphilitic obliteration of right occipital artery, with softening of cuneus. Glaucoma can hardly have produced hemianopsia.

Case 5.—Male, æt. fifty-one. Referred to me by Dr. Webster, at the Manhattan Eye and Ear Hospital, February 8, 1886.

A large, strongly-built man, who has enjoyed good health.

For a week at close of last year had occipital headache, aggravated by coughing. There was also pain over the left eye. On Jany. 13th, arose well, except as regards the headache, which was severe On the street, at 7½ A.M., suddenly experienced a sort of shock, felt dizzy, but did not fall. It seemed as if every thing was going round for a few moments. No aural phenomena. Next day noticed that he could not see persons standing near him on his left.

Examination—No paralytic phenomena, or anæsthesia. No head symptoms. Heart acts rapidly, and is rather large, but presents no murmur. The only symptom now present is left lateral hemianopsia. The vertical line is a little zig-zag in its course, and passes just to the left of the point of fixation. The upper quadrants of the right half-fields are somewhat limited. Central vision good. No ophthalmoscopic changes. Pupils and eye muscles normal.

Pathological Diagnosis.—Hemorrhage in right occipital lobe ; in its apex, or near mesal aspect, involving the cuneus.

CASE 6.—Male, æt. forty-one. Seen Oct. 7, 1885. Former health good. Denies any form of venereal disease, and injury to head. One of his brothers is in last stages of tabes (was under my care some seven or eight years ago). Four weeks ago, in the country, had two severe attacks of vomiting. After the second, noticed diplopia for distant objects. Has also noticed an increasing weakness of both legs and awkwardness in gait. No vertigo, and only trifling headache since.

Examination.—Walk a little uncertain with tendency to right. Not an ataxic nor yet a cerebellar walk. Patellar reflex and station normal. No paralytic symptoms or anæsthesia.

Left pupil is a trifle larger ; both active. No diplopia to-day. Typical left lateral hemianopsia, with vertical line passing a little to left of point of fixation.

Oct. 12th. Dr. E. Gruening saw patient and reported central vision good, no diplopia, no changes of nerves or retinæ ; hemianopsia as above.

Nov. 7th. Diplopia for distance present of late (due to weakness of left external rectus). Ophthalmoscope shows slight swelling of optic disks. Hemianopsia

On Nov. 10th, Dr. Gruening verified diagnosis of double neuro-retinitis, and found both external recti weak.

When last seen (Nov. 13th) patient exhibited failing vision, the same hemianopsia, convergent strabismus (both eyes turned), and marked weakness of both legs. Patellar reflex much increased. Left arm weaker (?) Abnormal drowsiness is a symptom which has existed from the beginning. Can sleep at any time in chair. Mind clear.

Pathological diagnosis.—Tumor of right inner occipital lobe extending forward and upward. Centres for legs involved (?) Pressure on lobus opticus (?)

I reject basal tumor because of late appearance of neuro-retinitis, preserved pupillary reaction, and absence of crossed hemiplegia.

REMARKS. 1.—The relatively frequent association of lateral hemianopsia with hemiparesis, hemianæsthesia, and hemiataxia is very interesting. Exclusive of the hemianopsia such cases constitute the symptom-group known as post-hemiplegic chorea, in which the abnormal movements (in our experience) may vary from choreic tremor to ataxia, and athetoid movements. It has been quite well settled that in such cases the lesion is to be found in the lateral part of the thalamus, and that it often impinges on the caudal segment of the internal capsule (*carrefour sensitif* of French writers). We may therefore reasonably conclude

that the super-addition of lateral hemianopsia to the above symptom-group indicates an extension of the lesion dorso-laterad so as to involve the fasciculus opticus.

Alexia was present in two of the cases.

2.—In the second group the hemianopsia stands out as almost the only symptom of gross (or focal) cerebral disease. Consequently, from the results of autopsies in other cases,[1] we are justified in locating the lesion either in white substance of one occipital lobe (injuring the fasciculus opticus), or in most cases, we think, in one cuneus and adjacent gray matter (cortical visual centre).

3.—In one case (No. 1 of group II.) there was temporary complete blindness, which resolved itself into permanent hemianopsia. In this case it is probable that both cunei were injured at first. In the same case a second fresh lesion developed two months later, causing temporary aphasia and right hemiplegia.

4.—In two cases (Nos. 4 and 6 of group II.), marked and progressive weakness of the legs would suggest an upward or dorso-frontal extension of the lesion (tumor) so as to involve the paracentral lobules (centres for the legs). In such a manner a strictly cerebral paraplegia might arise.

5.—The ophthalmoscope revealed changes only in two cases (Nos. 4 and 6 of group II.). In the former were seen the cupping and partial atrophy of the optic nerve, due to glaucoma. In the second typical neuro-retinitis was developed while the patient was under observation.

6.—In no case was Wernicke's hemiopic pupillary reaction observed.

7.—A very interesting symptom, not heretofore described (to my knowledge), occurred in one case, viz., No. 3 of group II. This consisted in hallucinating images in the half-fields which had just become blind. The images were few and simple, such as a chicken, a chair, etc., and rapidly passed away. It seems to me that these hallucinations represented the irritation of the cortical visual centre just previous to its

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[1] *Vide*, A Contribution to the Pathology of Hemianopsia of Central Origin (Cortex-Hemianopsia), this JOURNAL, Jan. 1886.

destruction ; and that they are the analogues of the localized convulsions which are now generally spoken of as indicating an irritating lesion of the cortical motor centres. That "discharges" or excitation symptoms should occur when a sensory cortical centre is irritated by disease, as well as when a motor centre is similarly affected, is perfectly reasonable ; being, moreover, in strict analogy with the results (peripheral symptoms) of pressure and irritation of nerve trunks. It is probable that further inquiry will show that hallucinations occur not infrequently at the outset of hemianopsia.

8.—An important point in semeiology, and one which I propose studying further, is the invariable (?) preservation of central vision. It make no difference whether we have to deal with right or left lateral hemianopsia (in the foregoing series there were five on right side and four on left side), the vertical division line always passes a little away from the point of fixation, *i. e.*, a little toward the blind half-field in either eye. Practically it is found that vision is often perfect directly in front of the patient, No. 1 Jaeger being read. It follows that in the fundus of the eye the region of the macula escapes the paralysis of the half of the retina. Can this be due to the peculiarity of structure of the macula, or is there a special set of nerve fibres connecting the macula with the cortical visual centres? It is premature to speculate on these alterations, and much will yet have to be done before we possess the anatomical and pathological data for the solution of the problem.

9.—The anatomical or pathological diagnosis in living cases must always be stated with reserve. Yet, guided by results already obtained, an attempt should be made in all cases. In the foregoing cases the lesions were probably as follows:

Syphilitic arteritis with obliteration, and consequent softening	1 case.
Senile arteritis with obliteration, and consequent softening	2 cases.
Cerebral hemorrhage	3 "

Tumor of one occipital lobe . . . . . 2 cases.
Embolism of occipital artery . . . . . 1 case.

10.—A special pathological question of much interest presents itself in case 4 of group II. Can glaucoma cause true lateral hemianopsia? While ready to admit that glaucoma can produce extensive breaks in the visual fields, in some cases approximating hemianopsia, I cannot understand how an intra-ocular pressure could be so distributed as to affect only homonymous halves of the retinæ, with a vertical division line between the light and dark half-fields. And how explain the preservation of central vision for nearly three years on the hypothesis of an intra-ocular disease? That an irregular partial lateral hemianopsia existed in case 4 at the time of the iridectomy is established, as a fact, but it is also established that true geometric lateral hemianopsia was not discovered until fourteen or fifteen months afterward. I think that in this case we must admit the coexistence of the diseases, glaucoma, and (probably) tumor in one occipital lobe.